HINGE FOR COLLAPSIBLE FLATRACK

FIELD OF THE INVENTION

[0001] The present invention is directed to a common collapsible flatrack shipping container configuration comprising a rectangular platform base, with opposite, inward folding end walls.

BACKGROUND OF THE INVENTION

[0002] Shipping containers having end walls are typically carried between folding corner posts, themselves pivotally mounted upon the base. Both end walls are folded down upon the base to serve as a compact collapsed mode, for economical transport and storage - also allowing mutual stacking in a return-empty mode. Such flatracks are vulnerable to rough handling in service, there being no superstructure between opposite end walls to help keep them upright. The end walls are secured at each base corner by a lockable hinge.

[0003] Given a shortage of proper lifting equipment to suspend flatracks by top corner fittings under vertical loading, there is a temptation to use inclined slings. Slings tend to pull the end walls inwards - risking hinge, or corner post failure.

[0004] Commercial considerations demand low cost comer post and hinge strengthening to help withstand such bending loads. Thus, one stronger flatrack type uses an 'I' section corner post which is very resistant to bending. Such an 'I'-post is typically mounted upon an inner hinge portion configured as a solid plate. However, solid plate hinges are extremely heavy and expensive to make. Thus, the plate has to be drilled through accurately, to accommodate pivot pins, and locking pins which lock the hinge in the open position with end walls erect.

[0005] Market trends are for taller containers, with taller corner posts. The taller the posts, the greater the racking forces near the hinge and post bases - so

again strengthening is desirable to resist these forces. It is also desirable for containers to carry more payload per consignment. Taller, heavier cargos require a lighter weight flatrack. Thus a lighter weight, stronger and cheaper hinge is desirable in collapsible flatrack construction.

OBJECT AND SUMMARY OF THE INVENTION

[0006] It is a general object of the present invention to provide a hinge comprising an inner portion, of multiple elements, including opposed flanges, with an intervening web, of bespoke configuration and relative disposition.

[0007] It is a further object of the invention to provide a hinge inner portion, for a collapsible flatrack, comprising a composite beam, of multiple discrete web and flange elements, mutually assembled and secured.

[0008] In accordance with the above objects there is provided a fabricated hinge construction for mounting a folding corner post and/or end wall, upon a platform base of a collapsible flatrack container, the hinge comprising an inner portion, carried by a pivot pin, captive in a hinge outer portion, in turn secured to the platform base, and fabricated of multiple discrete elements, including opposed flanges, with an intervening web.

[0009] Fabrication from multiple elements allows judicious adoption of bespoke flange and web profiles to suit loading, such as with differential flange width. Hinge flanges are desirably configured to unite with corresponding corner post flanges, by, say, end abutment, overlay, superimposition or mutual inset.

[0010] A laminated construction may be employed, with a plurality of juxtaposed web plates, secured (e.g., welded) together, and/or between common individual flanges, or multiple juxtaposed flange portions.

[0011] Fabrication of discrete elements could admit replaceable/demountable web and/or flanges, allowing (re-)assembly in different configurations.

Conveniently, an outboard flange is profiled locally, such as with a cut-out or recess, to accommodate a hinge locking detent. Alternatively, an outboard flange may be profiled, with corresponding web span, to achieve a waisted overall profile, with superimposed blocks secured outboard thereof, to define an intervening recess or cut-out.

[0012] Fabricated, forged or cast construction may be used for component elements, individually or collectively, to meet individual and/or collective loading. Respective profiles of hinge (inner portion) and corner post are configured to meet anticipated loading and to allow secure post mounting.

[0013] A joint between hinge and post may incorporate some relative mating, interfit or overlap. Alternatively, a 'butt' (abutment) joint between respective profiles, or a hinge top flange plate and post end, might be employed.

[0014] Post sections include, 'I' beam, 'U' or 'C' sections, hollow or solid rectangular tubular forms. Similarly, hinge inner portion forms include 'I' beam, 'U' or 'C' sections. A hinge outer portion is conveniently a 'U' or 'C' throat section to receive a hinge inner portion. This may also be a fabricated or mixed fabrication, casting or forging.

[0015] Should part of the hinge inner portion be damaged, the damaged part may be burnt off from the hinge inner portion and a new part welded in place, rather than having to replace the whole and costly hinge inner plate.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] FIG. 1 shows a side elevation of a collapsible flatrack;

[0017] FIG. 2 shows an enlarged view of a conventional end wall (corner) post bottom hinge for the flatrack of Figure 1;

[0018] FIG. 3 shows an enlarge view of an end wall (corner) post bottom hinge fabricated alternative for the flatrack of Figure 1;

[0019] FIG. 4 shows a variant fabricated hinge to that of Figure 3;

[0020] FIG. 5A shows a comparative section of hinge inner portion, more specifically, a conventional solid plate hinge inner portion located in a hinge outer throat;

[0021] FIG. 5B shows a comparative section of hinge inner portion, more specifically, a corresponding view to Figure 5A, but for a fabricated 'I'-section hinge inner according to the invention, with differential opposed flange widths and a relatively slender intervening web;

[0022] FIG. 6A shows an exploded perspective view of a fabricated hinge construction of Figure 3, with a post integration option, more specifically, a fabricated hinge inner portion;

[0023] FIG. 6B shows an exploded perspective view of a fabricated hinge construction of Figure 3, with a post integration option, more specifically, a hinge outer portion, pivot pin and locking bar, to receive the hinge inner of Figure 6A;

[0024] FIG. 7A shows an exploded perspective view of a fabricated hinge construction of Figure 4, more specifically, a fabricated hinge inner portion;

[0025] FIG. 7B shows an exploded perspective view of a fabricated hinge construction of Figure 4, more specifically, a hinge outer portion, pivot pin and locking bar, to receive the hinge inner of Figure 7A;

[0026] FIG. 8A shows a side elevation view of various bottom flange and pivot boss configurations for an inner hinge portion, more specifically, a hinge

bottom flange configured as a 'J' shaped strap, wrapped around a pivot boss and joined to an inboard flange upstand;

[0027] FIG. 8B shows a side elevation view of various bottom flange and pivot boss configurations for an inner hinge portion, more specifically, an 'I' beam bottom mount, with an intervening pivot boss captured in a web between flanges;

[0028] FIG. 8C show side elevation views of various bottom flange and pivot boss configurations for an inner hinge portion, more specifically, a solid block bottom flange with integral pivot boss;

[0029] FIG. 9 shows a hinged post bottom mounting;

[0030] FIG. 10A shows various post sections, taken along line 10-10' in Figure 9, more specifically, an 'I' section post;

[0031] FIG. 10B shows various post sections, taken along line 10-10' in Figure 9, more specifically, a solid rectangular section bar post;

[0032] FIG. 10C shows various post sections, taken along line 10-10' in Figure 9, more specifically, a hollow rectangular section tubular bar post;

[0033] FIG. 10D shows various post sections, taken along line 10-10' in Figure 9, more specifically, a 'U' or 'C' section post;

[0034] **FIG.** 11A shows sectional views of various hinge inner portion forms, united with diverse post sections, taken along line 11-11' in Figure 9, more specifically, a solid post united with an 'I' section hinge inner portion;

[0035] **FIG.** 11B shows sectional views of various hinge inner portion forms, united with diverse post sections, taken along line 11-11' in Figure 9, more specifically, a hollow post united with an 'I' section hinge inner portion;

[0036] **FIG.** 11C shows sectional views of various hinge inner portion forms, united with diverse post sections, taken along line 11-11' in Figure 9, more specifically, a solid post united with a hollow section hinge inner portion;

[0037] **FIG.** 11D shows sectional views of various hinge inner portion forms, united with diverse post sections, taken along line 11-11' in Figure 9, more specifically, a 'U' or 'C' section hinge inner portion united with a hollow post;

[0038] **FIG.** 11E shows sectional views of various hinge inner portion forms, united with diverse post sections, taken along line 11-11' in Figure 9, more specifically, a 'U' or 'C' section hinge inner portion united with a hollow post;

[0039] **FIG.** 11F shows sectional views of various hinge inner portion forms, united with diverse post sections, taken along line 11-11' in Figure 9, more specifically, a hollow hinge inner portion united with a an 'I' beam post plate;

[0040] **FIG.** 11G shows sectional views of various hinge inner portion forms, united with diverse post sections, taken along line 11-11' in Figure 9, more specifically, a 'U' or 'C' section hinge inner portion united with an 'I' beam post plate.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0041] Referring to the drawings, a collapsible flatrack 11 has a platform base with a floor surface 12 surmounted at opposite ends by folding end walls 13 carried between hinged corner posts 17.

[0042] At each bottom corner there is a corner fitting 14 and a base 20, into which is fitted a hinge inner portion 18, captured by a pivot pin 19.

[0043] The hinge outer portion 21 has a top (plate) fitting 15, through which hinge inner portion 18 passes when an associated corner post 17 is erected into a vertical position.

[0044] At the top of each corner post 17 is a top capture fitting 16, to which is attached a hook 22 termination to one end of a suspension sling 23.

[0045] Opposed limbs of sling 23 are inclined to the vertical 'V' by angle 'A'.

[0046] If the flatrack 11 be lifted by sling 23, a horizontal component 'H' is generated in top fittings 16.

[0047] This imposes a considerable bending movement upon both the hinge inner portion 18 and outer portion 21.

[0048] In FIG. 2 the hinge outer portion 21 is part cut-away, to reveal a hinge inner portion 18, configured as an 'L' shaped profile in heavy plate.

[0049] Typical plate thickness would be some 60mm.

[0050] A top (plate) fitting 15, shown in section, is part-cut away, to receive inner portion 18.

[0051] Pivot pin 19 is secured to base 20.

[0052] A corner post 17 is attached to the upper end of inner hinge portion 18 - typically by heavy duty welding between opposed flanges 24 and 25.

[0053] In the erect position shown, the hinge 26 - of outer portion 21 and inner portion 18 - is prevented from folding down upon base 20 by a locking pin 27.

[0054] Locking pin 27 blocks movement of a heel 28 of inner portion 18 and a back plate 29 of top fitting 15.

[0055] Only when pin 27 is withdrawn can heel 28 pass back plate 29 and allow the hinge inner portion 18 - with attached corner post 17 - to fold through some 90° upon (contacting or marginally overlying) base 20.

[0056] With hinge 26 locked and corner posts 17 erect, it is important to maintain top fitting 16 geometry, for interface, without adjustment, with standardized handling equipment or other containers.

[0057] It is important that pivot pin 19 and locking pin 27 locate accurately with heel 28 and back plate 29, to stop post 17 wobble.

[0058] Thus, in manufacture of hinge inner portion 18, the recess 30 into which locking pin 27 fits, and pivot pin 19 position in relation to locking pin 27 and recess 30 must be accurately machined, to maintain geometry.

[0059] However, inner portion 18 typically weighs some 50 or 60 kilos, reducing opportunities for high speed CNC machining.

[0060] In FIG. 1, strengthening of, say, right hand corner post 17 would most economically be done so by increasing its depth, to chain line 17'.

[0061] In FIG. 2, for increased post 17 depth, flange 25 is depicted repositioned to chain lined flange 25'.

[0062] Likewise, the hinge inner portion 18 must also be increased in depth to maintain strength, so leading face 31 is depicted reposition to chain line face 31'.

[0063] However, this desirable substantial strength increase brings an undesirable weight and cost penalty.

[0064] FIG. 3 shows a fabricated multiple portion hinge embodiment of invention.

[0065] More specifically, a thick plate hinge inner portion 18 is replaced by a fabricated inner hinge portion 32.

[0066] The fabrication comprises an inboard flange 33, an outboard flange 34, with an intervening web 37 and top and bottom end flanges 35 and 36.

[0067] Web 37 might comprise one or more relatively thin plates (i.e. a lamination), joined by a peripheral weld to flanges 33, 34, 35, and 36.

[0068] Corner post 17 has an inboard flange 25', juxtaposed with inboard hinge flange 33.

[0069] For a narrower or wider corner post and hinge, inboard flange 33 is readily transposed to juxtapose with relocated corner post inboard flange 25', merely by adopting an appropriate size of web 37.

[0070] An inboard offset pivot boss 38 is configured as a stub tube fitted at the junction of flanges 33, 36.

[0071] In production, outboard flange 34 has recess 30 machined in it as previously, but in this example is very much lighter weight than thick plate hinge inner portion 18 - so can be hand fed to a CNC machine tool for very quick, low cost, and accurate machining.

[0072] Similarly a pivot boss 38 can be machined as a small component upon a lathe, with through hole bored out accurately.

[0073] By careful jigging, components can be positioned, clamped together and welded, manually or robotically - without further machining of hinge inner portion 32.

[0074] In terms of bending plane stress of FIG. 3, web 37 can be relatively thin, say as little as 10mm, compared to a heavy hinge plate 18 some 60mm deep.

[0075] In an alternative fabricated construction of FIG. 4, flange 34 might be made from a rolled bar, some 60mm wide by 30mm thick - cut to length and formed at 34' to meet a corner post flange 25.

[0076] Recess 30 can be provided by addition of a steel block 40, welded at 41 to flange 34 - saving machining cost, yet providing an abutment 42 to engage locking pin 27.

[0077] FIG. 5A shows a top plate fitting with an open-sided aperture 44 of standard width W, say 62.5mm - contrived to mate with known handling equipment and coupling devices, such as twistlocks.

[0078] When in the erect position shown, the hinge inner portion 18 cannot be made any wider than 'W' - and is typically some 60mm wide, of solid plate.

[0079] FIG. 5B depicts a fabricated hinge inner portion 32, with flanges 33, 34 and web 37, according to the invention.

[0080] Whereas outboard web 34 must be of some 60mm span, to pass through width Wx of aperture 44 in the hinge outer portion and top capture fitting 15, the inboard flange 33 can be made wider Wy, as shown.

[0081] The cost of profiling a 60mm thick steel plate is great compared to thinner, say 10mm, web plate 37.

[0082] In bending in the vertical plane, as experienced under inclined sling lifting loads, flanges 33, 34 of hinge inner portion 32 are stressed to a higher level than web 37, given their greater distance from the hinge inner neutral axis, of chain line 43 in FIG. 4.

[0083] Thus the yield point of the steel used for flanges 33, 34 needs to be higher than needed for web 37, to resist bending loads.

[0084] In the prior art, the whole of a single piece of plate 18 must be formed from high yield point steel - an inefficient use of material adding further to cost.

[0085] Availability of high yield steel plate is not as good as bar steel used in flanges 33, 34.

[0086] Moreover, where very high yield steel of weldable grade is needed, such 60mm plate is unavailable.

[0087] Thus a hinge of equivalent strength to a hinge inner made with flanges 33, 34 could not be constructed.

[0088] In FIG. 5B, the width of outboard flange 34 cannot exceed the 62.5mm width W of aperture 44, through which it should pass when corner post 17 is erect.

[0089] For geometric reasons, outboard flange 34 is therefore made some 60mm thick.

[0090] However, inboard flange 33 does not pass through the aperture and so can be made wider.

[0091] Fabricated, say welded plate, hinge components could be combined individually or collectively with, or replaced in whole or part by, say forging or casting.

[0092] Thus, flange 34 could be forged with recess 30 from a single piece of bar steel.

[0093] Similarly, an entire hinge inner portion 32 could be a unitary forging or casting, with integral recess 30, flanges 33, 34, web 37 or end plates 35, 36.

[0094] Boss 38 might be formed separately for welded attachment to the forged component.

[0095] Although an 'I'-section hinge inner portion 32 has been described, in principle other forms could be employed, such as 'U' or 'C'-sections.

[0096] FIGS. 6A, 6B and 7A, 7B present an exploded perspective of hinge construction, with interfitting inner and outer hinge portions, and providing a post mounting - and are generally self-explanatory, so will not be described individually in detail.

[0097] An option of a contiguous corner post is depicted in FIG. 6A.

[0098] Similarly, FIGS. 8A through 8C explore hinge bottom flange and pivot mounting diversity - and are generally self-explanatory, so will not be described individually in detail.

[0099] FIGS. 9, 10A through 10D, & 11A through 11G explore diversity of post and hinge mounting - and are generally self-explanatory, so will not be described individually in detail.

[0100] Fabrication from multiple elements enables reduced replacement costs when only part of the hinge is damaged.

[0101] In conclusion, a hinge for collapsible flatrack container has been provided.